



Inventek Systems
Embedding Connectivity Everywhere

eS-WiFi Module AT Command Set

User Manual

eS-WiFi Module
'embedded Serial-to-WiFi'

AT Command Set

User Manual

Inventek Systems, Inc.

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Inventek Systems is a USA-based, full-service wireless solutions provider focused on 802.11 b/g/n WiFi embedded solutions, GPS embedded modules and antennas. We provide a wide range of standard and custom embedded options ranging from low cost system-in-a-package (SiP) products to modular based custom solutions. We provide complete services from consulting to custom design to cost effective high volume manufacturing.

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AT Command Set User Manual

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1. Introduction

1.1 Scope

The scope of this document is to introduce users to Inventek System's AT Command Set for the eS-WiFi Module product, and to explain how to take advantage of the AT Command Set for WiFi Communications.

1.2 AT Command Usage in the User Manual is shown as

Usage: < AT Command > < optional '=' > < data if '=' is used > < Carriage Return (CR) >

or

< AT Command > < CR >

And default values are show as

Default: <AT Command>=<Value>

1.3 Supported Product Versions

This document covers the following currently available eS-WiFi modules:

ISM4319-M3-L44-C	(Ceramic Antenna)
ISM4319-M3-L44-E	(Printed Micro-strip Antenna)
ISM4319-M3-L44-U	(U.FL Connector to external antenna)
ISM4319-M3G-L44-E	(Printed Micro-strip Antenna)
ISM43362-M3G-L44-E	(Printed Micro-strip Antenna)
ISM43362-M3G-L44-U	(U.FL Connector to external antenna)

1.4. AT Command Set

In the early 1980's, Hayes Microcomputer Products, Inc. was one of the first modem manufacturers to use an 'AT' type Command Set to control operations of their modem products for communication over the Plain Old Telephone Service (POTS).

Since then a number of products have been developed for communications that use the 'AT Command Set' for device control.

'AT' is short for 'AT'tention, and is used to get the attention of a device for set up and control of its functions. Normally, following the 'AT' command would be other letters and numbers that would control the functions associated with the command. For example, 'ATDT1234567' means ATtention modem Dial with Tone the number following the command, which in this case is 1234567.

Common practice today is to shorten the 'AT' command to just the function command, which using the example above, the shorten command to dial using tone for a number would be DT1234567.

1.4.1 Entering AT Commands

As mentioned above, it is common practice to drop the 'AT' in front of a device control command and just use the device control function command letters and number combinations. Inventek System has adopted this method for controlling the functions of the eS-WiFi module. In addition, Inventek System has

added an '=' to the command to delimit the command from its data. For example, the AT Command to set the eS-WiFi module's IP Address would be 'C6=127.0.0.1' instead of 'ATC6=127.0.0.1'.

Also, a number of AT Commands for the eS-WiFi module only use a single letter or a single letter plus number to execute the command. For instance, '?' will return available help information on the eS-WiFi module. While a 'C0' command would command the eS-WiFi module to joined a network. The format for entering AT Commands is shown as follows:

< AT Command > < optional '=' > < data if '=' is used > < Carriage Return (CR) >

or

< AT Command > < CR >

All AT Commands must be followed by a <CR> to activate the command.

Empty string values for AT Commands are shown with 'NONE' in the User Manual.

Supported character sets:

Currently, the eS-WiFi module only supports 8 bit ASCII. All AT Commands must be in capital letters; however, data can contain both upper and letter case letters, and numbers.

Future support for binary data transfers to be added.

2 Hardware Interface and Module Operation

The eS-WiFi module supports RS-232 Serial Communications Universal Serial Bus (USB), and Serial Peripheral Interface Bus (SPI). A Micro-Controller or System Host can easily interface to the eS-WiFi module using one of the support hardware interfaces.

The eS-WiFi module has two modes of operation: Human Readable Mode and Machine Readable Mode.

2.1 RS-232 Serial Communication

2.1.1 Data Mode

When the eS-WiFi module is interfaced serially, the serial interface needs to be configured for 8 bit data, no parity, and one stop bit -- (8-n-1).

2.1.2 Flow Control

The eS-WiFi module doesn't require or support Flow Control, so Flow Control should be 'None'

2.1.3 Supported Baud Rates

The eS-WiFi module supports the following serial baud rates:

Basic Rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600

Extended Rates: 1152000, 1382400, 1612800, 1834200, 2073600
(M3G Only)

2.1.2 Default Serial Configuration

The eS-WiFi module is shipped with the default serial configuration of 115200 baud, 8 data bits, no party, and 1 stop bits.

2.2 USB (Universal Serial Bus)

(TBD)

2.3 SPI (Serial Peripheral Interface Bus)

(TBD)

2.4 Module Operation Modes

The eS-WiFi module has two modes of operation, Human Readable Mode (verbose) and Machine Readable Mode, that can be used to control the operation of the module. At power up, the eS-WiFi module defaults to Machine Readable Mode. An AT command is used to put the eS-WiFi module into Human Readable Mode or Machine Readable Mode.

2.4.1 Human Readable Mode

In Human Readable Mode, a user can interact with the module via the module's built-in console and a serial terminal program. All AT commands will return detail information related to the operation of the command.

2.4.2 Machine Readable Mode

Machine Readable Mode is intended for direct control of the eS-WiFi module operation via a Micro-Controller or System Host. All AT commands will return short, limited information about operation of the command.

PRELIMINARY

3. AT Command Set Version 2.0

3.1 AT Command Set List of Supported Functions

AT Command	Description
?	Print Help Message
\$\$\$	Enter Command Mode
---	Exit Command mode
A0	Activate Access Point
A1	Set Access Point Security Mode
A2	Set Access Point Security Key
AC	Set Access Point Channel
AD	Activate Access Point Direct Connect Mode
AE	Exit Access Point Direct Connect Mode
AL	Set Access Point Lease Time
AS	Set Access Point SSID
A?	Show Access Point Settings
B0	Activate Communication Interface Settings
B1	Set Communication Interface
B?	Show Communication Interface Settings
C0	Join a Network
C1	Set Network SSID
C2	Set Network Passphrase
C3	Set Network Security Type
C4	Set Network DHCP Mode
C5	Set Network IP Version
C6	Set Network IP Address
C7	Set Network IP Mask
C8	Set Network Gateway
C9	Set Network Primary DNS

AT Command	Description
CA	Set Network Secondary DNS
CB	Set Network Join Retry Count
CC	Network Auto Connect
CD	Disconnect from Network
CE	Set Authorization Type
CF	Set/Clear Packet Filters (PBM Only)
CJ	Join/Leave IGMP Group
CM	Add/Remove MAC To/From MCAST Allow List (PBM Only)
CN	Set Country Code (See Appendix A for Codes)
CR	Get RSSS of Associated Network Access Point
CS	Get Connection Status
C?	Show Network Settings
E2	HID Keep-alive
F0	Scan for Network Access Points
F1	Set Scan Repeat Count
F2	Set Scan Delay (ms)
F?	Show Scan Settings
G2	Read GPIO/ADC
G3	Write GPIO
G4	GPIO Setup
G?	Show GPIO Settings
I?	Show Application Information
P0	Activate Transport Settings
P1	Set Transport Protocol
P2	Set Transport Local Port Number
P3	Set Transport Remote Host IP Address
P4	Set Transport Remote Port Number
P5	Stop/Start Transport Server
P6	Stop/Start Transport Client

AT Command	Description
P7	Start/Stop Request TCP Loop
P8	Set Listen Backlogs
PR	Read Mode, Packet Bypass Mode
PW	Write Packet, Packet Bypass Mode
P?	Show Transport Settings
R0	Read Transport Data
R1	Set Read Transport Packet Size (bytes)
R2	Set Read Transport Timeout (ms)
R3	Receive Mode
R?	Show Read Transport Settings
S0	Write Transport Data
S1	Set Write Transport Packet Size (bytes)
S2	Set Write Transport Timeout (ms)
S?	Show Write Transport Settings
T0	Ping Target Address
T1	Set Ping Target Address
T2	Set Ping Repeat Count
T3	Set Ping Delay (ms)
T?	Show Ping Settings
U0	Active UART Settings
U2	Set UART BAUD Rate
U?	Show UART Settings
Z0	Reset to Factory Defaults
Z1	Save Current Settings
Z2	Clear Current Settings
Z3	Set Factory/User Space
Z4	Set MAC Address
Z5	Get MAC Address
Z6	Set Access Point IP Address

AT Command	Description
Z7	Set WPS (WiFi Protected Setup) Pin Number
Z8	Get WPS (WiFi Protected Setup) Pin Number
Z9	Set USB VID/PID
ZC	Clear Factor Lock Switch
ZD	Flash Dump
ZF	Set Factory Lock Switch
ZP	Power Management
ZR	Reset Module
ZU	Firmware Upgrade (M3G Only, use STM32F205 boot loader)
Z?	Show System Settings

Table 3.1: AT Command Set List

4. AT Command Detail Description

4.1 '?' Print Help Message

Print Help menu to console.

Usage: ?<CR>

Default Value: None

4.2 '\$\$\$' Enter Command Mode

Command (Human Readable) Mode is entered via '\$\$\$'. While in Command mode, all AT Commands return detail text formatted information to the user when the command is executed. Command Mode is helpful when debugging network interfaces or interaction with the eS-WiFi module.

Usage: \$\$\$<CR>

Default Value: None

4.3 '---' Exit Command Mode

Command Mode is exited via '---', which places the eS-WiFi module in Machine Readable mode where AT Commands generate short, limited coma delimited information on the execution of a command. Machine mode is intended for Micro-Controller or Host System control of the eS-WiFi module.

Usage: ---<CR>

Default Value: ---

4.4 Access Point

Used to setup the internal Access Point (Network Access).

4.4.1 'A0' Activate Access Point

Starts the Access Point, DHCP Server, DNS Server, and Web Server.

Usage: A0<CR>

Default Value: None

4.4.2 'A1' Set Access Point Security Mode

Set the security mode for the Access Point

Usage: A1=<Mode><CR>

WiFi Security	WiFi Security Mode	Description
Open	0	No WiFi Security
Reserved	1	Not Valid
WPA	2	WiFi Protected Access
WPA2	3	WiFi Protected Access 2
WPA + WPA2	4	WiFi Protected Access and WiFi Protected Access 2

Default Value = 0 (Open)

4.4.3 'A2' Set Security Key

Security Key can be up to 32 characters and is an unique security keyword for access to a wireless network. A system (PC, Smartphone, Tablet, etc) must use the Security Key to associate with the eS-WiFi Access Point to communicate with the eS-WiFi Module.

Usage: A2=<Key><CR>

Default Value: None

4.4.4 'AC' Set Access Point Channel

Set the channel the Access Point will broadcast on. The channels are from 1 to 13 based upon the Country Code setting for the eS-WiFi module.

Usage: AC=<Channel><CR>

Default Value: 1

4.4.5 'AD' Activate Access Point Direct Connect Mode

Starts the Access Point, DHCP Server, and minimal CSO(Connection Support Only) Web Server.. The CSO Web Server handles the support for connecting Apple devices with iOS6 and other devices that require addition support to connect to a captive network.

Usage: AD<CR>

Default Value: None

4.4.6 'AE' Exit Access Point Direct Connect Mode

Shuts down the Access Point, DHCP Server, and Web Server when the connected using the Direct Connect mode. This is for both the 'A0' and 'AD' commands. For the 'A0' command this is only needed when a Direct Connection has been made through the Network Access Web Page.

Usage: AE<CR>

Default Value: None

4.4.7 'AL' Set Access Point DHCP Lease Time

Set the lease time given by the DHCP Server when an IP address has been assigned.

Usage: AL=<Lease Time><CR>

Value	Lease Time
0	30 mins.
1-255	1-255 hrs.

Default Value: 0(30 mins.)

4.4.8 'AS' Set Access Point SSID

Sets the Access Point SSID. It can be up to 32 characters in total length (including MAC if enabled).

Usage: AS=<MAC Mode>, <SSID><CR>

Value	MAC Mode
0	No MAC.
1	Use MAC.

Default Value: MAC Mode = 1, SSID = eS-WiFi_AP

4.4.9 'A?' Show Access Point Settings

Returns Access Point Settings

Usage: A?<CR>

Field	1	2	3	4	5	6	7
Function	SSID	IP Address	Channel	Security Type	Security Key	AP DHCP	Lease Time

Field	8
Function	Status

Default Value: None

4.5 Select Communication Interface

Used to select SPI, UART, or USB interface for communication with the eS-WiFi module.

4.5.1 'B?' Show Communication Interface Settings

Return current Communication Interface settings.

Usage: B?<CR>

Field	1	2	3	4	5	6	7
Function	Host						

Default Value: None

4.6 Configure Network Settings

Used to set up the network parameters needed to access a WiFi network.

4.6.1 'C0' Join a Network

Using the user defined parameters of SSID, Passphrase, Security Type, etc. attempt to join a WiFi network for access. A successful Join, returns SSID and IP Address; otherwise, an error message is return. A network cannot be re-joined once the eS-WiFi module has joined a network without first closing the current network connection.

Usage: C0<CR>

Default Value: None

4.6.2 'C1' Set Network SSID

Network Service Set Identifier (SSID) can be up to 32 characters and is an unique identifier (network name) for a wireless network. The eS-WiFi module must use the SSID, Passphrase and WiFi Security to communicate with a wireless network. The SSID is normally supplied by a network administrator.

Usage: C1=<SSID><CR>

Default Value C1=NONE

4.6.2 'C2' Set Network Passphrase

Network Passphrase can be up to 32 characters and is an unique security keyword for access to a wireless network. The eS-WiFi module must use the Passphrase associated with the network SSID and the WiFi Network Security to communicate with a wireless network. The Passphrase is normally supplied by a network administrator.

Usage: C2=<Passphrase><CR>

Default Value: C2=NONE

4.6.3 'C3' Set Network Security Type

Select the WiFi Network Security to use for communication with a WiFi network. Below is a list of WiFi Security Modes. The eS-WiFi module must use one the WiFi Security modes with the associated SSID and Passphrase to communicate with a wireless network. The WiFi Security is normally supplied by a network administrator. The Network WiFi Security Modes are listed in Table 4.2.

WiFi Security	WiFi Security Mode	Description
Open	0	No WiFi Security
WEP	1	Wired Equivalent Privacy
WPA	2	WiFi Protected Access
WPA2	3	WiFi Protected Access 2
WPA + WPA2	4	WiFi Protected Access and WiFi Protected Access 2

Table 4.2: Network WiFi Security Modes

Usage: C3=<WiFi Security Modes><CR>

Default Value: C3=0

4.6.4 'C4' Set Network DHCP

Dynamic Host Configuration Protocol (DHCP) is used to query a network for an available IP Address that would be used for communications on the network. The eS-WiFi module can use DHCP or a user defined IP Address. The eS-WiFi module must have an IP Address to communicate with a wireless network. The Network DHCP Modes are listed in Table 4.3.

DHCP	DHCP Mode
Disabled User supplied IP Address	0
Enabled Network supplied IP Address	1

Table 4.3: Network DHCP Modes

Usage: C4=<DHCP Modes><CR>

Default Value: C4=1

4.6.5 'C5' Set Network IP Version

Set Network IP Version is used to select between Internet Protocol Version 4 (IPV4) and Internet Protocol Version 6 (IPV6). The IP Version must be set for correct operation of the eS-WiFi module on a wireless network. The Network IP Version settings are listed in Table 4.4.

IP Version	IP Version Mode
IPV4	0
IPV6	1

Table 4.4: Network IP Version Modes

Usage: C5=<IP Version Modes><CR>

Default Value C5=0

4.6.6 'C6' Set Network IP Address

Set Network IP Address allows the user to define the IP Address that the eS-WiFi module will use on a wireless network. If DHCP is disabled, the IP Address must be set to allow the eS-WiFi module to work correctly on a wireless network. The IP Address must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx for the network address.

If DHCP is enabled, the IP Address will be set by the wireless network on a network join.

Usage: C6=<xxx.xxx.xxx.xxx.><CR>

Default Value: 000.000.000.000

4.6.7 'C7' Set Network IP Mask

Set Network IP Mask is a user defined value for the network net mask (subnetting of the network) used on the WiFi Network. If DHCP is disabled, the net mask must be set to allow the eS-WiFi module to work correctly on a wireless network. The net mask must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx.

If DHCP is enabled, the Net Mask will be set by the wireless network on a network join.

Usage: C7=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.6.8 'C8' Set Network Gateway

Set Network Gateway is a user defined Gateway IP Address used by the devices on the network to access other networks or as a default gateway when no other IP Address matches any other routes in the network routing table. The Gateway IP Address must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx.

Usage: C8=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.6.9 'C9' Set Network Primary DNS

Set Network Primary Domain Name System (DNS) is a user defined address used for translating human readable domain names into numerical identifiers for network devices. The Primary DNS must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx.

Usage C9=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.6.10 'CA' Set Network Secondary DNS

Set Network Secondary DNS is used as a back up to the Primary DNS. The Secondary DNS must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx.

Usage: CA=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.6.11 'CB' Set Network Join Retry Count

Set Network Join Retry Count is a user defined value that controls the number of times the eS-WiFi module will attempt to join a wireless network before stopping with a failure notice if the system is unable to join the network.

Input range for Join Retries is 0 to 10.

Usage: CB=<Join Retries><CR>

Default Value: 5

4.6.12 'CC' Network Auto Connect

Network Auto Connect allows the user to define whether or not the eS-WiFi module will attempt a Join a wireless network after the system is powered up and operational, or after a reset. The Network Auto Connect modes are listed in Table 4.5.

Auto Connect	Auto Connect Mode
Disable Network Auto-Join	0
Enable Network Auto-Join	1

Table 4.5: Network Auto Connect Modes

Usage: CC=<Auto Connect Modes><CR>

Default Value: 0

4.6.13 'CD' Disconnect from Network

To disconnect the eS-WiFi module from a wireless network, the AT Command 'CD' is used. 'CD' will shut down the network communications and clear the network IP Address, Net Mask, and Gateway Address assigned to the eS-WiFi Module.

Usage: CD<CR>

Default Value: None

4.6.14 'CE' Set Authorization Type

Set the authorization type for WEP security.

Usage: CE=<Type><CR>

Type	IP Version Mode
0	Open
1	Shared Key

Default Value: 0 (Open)

4.6.15 'CF' Set/Clear Packet Filter (Packet Bypass Mode)

Set/Clear the packet filters when operating in the PBM (Packet Bypass Mode). The PBM sends the received Ethernet packet directly to host interface bypassing the module's TCP/IP Stack.

Usage: CF=<Mode Byte><CR>

Bits	Filter
00	No Filtering
01	ARP
02	SNMP
40	IPv4
80	Multicast

Note: The filters remove the packets that are not directed to or are not part a Multicast group that has been enabled to the eS-WiFi module.

Default Value: 00 (No Filtering)

4.6.16 'CJ' Join/Leave IGMP Group

Join or leave a IGMP group.

Usage: CJ=<Action>,<Group IP Address><CR>

Action	Join/Leave
0	Leave
1	Join

Default Value: None

4.6.17 'CM' Add/Remove MAC Address To/From Multicast Allow List (Packet Bypass Mode)

Adds or removes a MAC address to or from the multicast allow list while in PBM.

Usage: CM=<MAC Address><CR>

Default Value: None

4.6.18 'CN' Set Country Code

Set the country code for the eS-WiFi module. The country code is a two letter code representing a country which selects which channels are valid to use.

Usage: CN=<Code><CR>

Please see Appendix A for the list of Country Code supported.

Default Value: 'US'

4.6.19 'CR' Get RSSI of Associated Access Point

Get the RSSI on the currently associated Access Point.

Usage: CR<CR>

Response	Description
0	No Associated AP
All other values	RSSI (dB)

Default Value: None

4.6.20 'CS' Connection Status

Gets the current network connection status.

Usage: CS<CR>

Response	Status
0	Not Connected
1	Connected

Default Value: None

4.6.21 'C?' Show Network Settings

Return current Configured Network Settings.

Usage: C?<CR>

Field	1	2	3	4	5	6	7
Function	SSID	Password	Security Type	DHCP	IP Version	IP Address	Mask
Field	8	9	10	11	12	13	14
Function	Gateway	DNS1	DNS2	Retries	Auto-Connect	Authent-ication	Country Code
Field	15						
Function	Status						

Default Value: None

4.7 USB Commands

4.7.1 'E2' HID Keep-alive

Enables/ Disable the HID Keep-alive. When Enabled the eS-WiFi module will send a data packet with a zero number of valid bytes. The allow systems that have a blocking read function to release.

Usage: E2<CR>

Default Value: None

4.8 Scan for Network Access Points

The eS-WiFi module can scan for available networks and return detail information about networks found without having to join a network. The information returned on the available networks includes SSID, BSSID, RSSI, Data Rate, Network Type, Security, Radio Band, and Channel. The information returned about Network Access Points can be used in joining one of the networks.

Scanning for Network Access Points is a very handy command for determining what wireless networks are in listening range of the eS-WiFi module.

4.8.1 'F0' Scan for Network Access Points

Find Networks can be used to scan for available networks and return information about the networks found.

Usage: F0<CR>

Default Value: None

4.8.2 'F1' Set Scan Repeat Count

Set Repeat Count is a user defined value that controls the number of times to scan for Network Access Points.

Input range for Set Scan Repeat Count is 0 to 255.

Usage: F1=<Set Scan Repeat Count><CR>

Default Value: 0

4.8.3 'F2' Set Scan Delay

Set Scan Delay is a user defined value that sets the amount of time in milliseconds to wait between scans for Network Access Points.

Input range for Set Scan Delay is 0 to 5000, which represents the delay in milliseconds.

Usage: F2=<Set Scan Delay><CR>

Default Value: 1000

4.8.4 'F?' Show Scan Settings

Returns current Scan Settings.

Usage: F?<CR>

Field	1	2	3	4	5	6	7
Function	Repeat (1+Repeat)		Delay (ms)				

Default Value: None

4.9 GPIO Information

4.9.1 'G2' Read GPIO/ADC

Reads the current value of the specified GPIO or ACD pin

Usage: G2=<Pin Number>,<Value><CR>

Value	Type
2	Button
3	Digital Input
5	ADC

Default Value: None

4.9.2 'G3' Write GPIO

Writes the current value of the specified GPIO pin.

Usage: G3=<Pin Number>,<Type Value>,<Value><CR>

Type Value	Type
1	LED
4	Digital Output

Value	Output
0	Low
1	High

Default Value: None

4.9.3 'G4' GPIO Setup

Sets the type of the specified GPIO pin.

Usage: G2=<Pin Number>,<Value><CR>

Value	Type
1	LED
2	Button
3	Digital Input
4	Digital Output
5	ADC

Default Value: None

4.9.4 'G?' Show GPIO Settings

The AT Command 'G?' will return the GPIO pin type..

Usage: I?<CR>

Field	1	2	3	4	5	6	7
Function	GPIO0	GPIO1	GPIO2	GPIO3	GPIO4	CFG0	CFG1

Default Value: None

4.10 Software Information

Information about the AT Command application that includes Firmware Version, WICED™ Version, IP Stack Name and Version, RTOS Name and Version can be access using the following AT Commands.

4.10.1 'I?' Show Applications Information

The AT Command 'I?' will return Application, Firmware, Platform, IP Stack, and FreeRTOS information.

Usage: I?<CR>

Field	1	2	3	4	5	6	7
Function	Product ID	FW Revision	API Revision	Stack Revision	RTOS Revision	CPU Clock	Product Name

Default Value: None

4.11 Transport Communication

Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) are used for point to point or port to port communications on a network. TCP is a guarantee port to port communication protocol that is used to insure data is transferred error free between a server and client. UDP is consider to be faster than TCP for the movement of data over a network; however, UDP does not guarantee the delivery of data between a server and a client. UDP lite is UDP with the partial removable of checksums which may improve network data movement performance but may be more prone to data errors.

The eS-WiFi module supports TCP, UDP, and UDP lite for port to port communication.

The eS-WiFi module can be configured as a server or client on a network for TCP/UDP communication. In Transport server mode, the eS-WiFi module will wait in the background for connection requests. Once a network device request a connection to the server, the server will enter a mode were data can be requested by a client and data delivered to a client.

The eS-WiFi module can also be configured as a client for TCP/UDP communications to make requests to a Transport server on the wireless network.

If UDP or UDP lite is used, it is recommended that the user develop their own packet numbering and error checking for data transfers.

4.11.1 'P0' Activate Transport Settings

Store Transport configurations to non-volatile memory for power on or after a reset default configuration.

Usage: P0 <CR>

Default Value: None

4.11.2 'P1' Set Transport Protocol

Set Transport Protocol allows the user to enable selection of either TCP, UDP, or UDP Lite for network port to port communications. The Transport Protocols modes are listed in Table 4.6.

Transport Protocol	Transport Protocol Mode
TCP Enabled	0
UDP Enabled	1
UDP Lite Enabled	2

Table 4.6: Transport Protocol Modes

Usage: P1=<Transport Protocol Modes><CR>

Default Value: P1=0

4.11.3 'P2' Set Transport Local Port Number

Set Transport Local Port Number allows the user to define the local port that the eS-WiFi module will listen on for Transport communication connections.

Input range for Transport Local Port Number is 0 to 65535.

Usage: P2=<Transport Local Port Number><CR>

Default Value: P2=5024

Refer to documentation on TCP/UDP communications for pre-defined port information.

4.11.4 'P3' Set Transport Remote Host Port IP Address

Set Transport Remote Host IP Address is a user defined address that eS-WiFi module will use to contact a Transport server on the network. The Transport Remote Host IP Address must be entered in dotted-decimal notation, which is defined as xxx.xxx.xxx.xxx for the network address.

Usage: P3=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.11.5 'P4' Set Transport Remote Port Number

Set Transport Remote Port Number allows the user to define the port number for a Transport Server on the network that the eS-WiFi module will use for communications with that server.

Input range for Local Port is 0 to 65535.

Usage: P4=<Local Port><CR>

Default Value: P4=5025

4.11.6 'P5' Stop/Start Transport Server

Stop/Start Transport Server is used to stop or start the eS-WiFi module's Transport Server mode. The AT Command 'P1' is used to select between TCP, UDP or UDP Lite server protocols. The Transport Server modes are listed in Table 4.7.

Transport Server	Transport Server Mode
Server Disable	0
Server Enable	1

Figure 4.7: Transport Server Modes

Usage: P5=<Transport Server Modes><CR>

Default Value: P5=0

4.11.7 'P6' Stop/Start Transport Client

Stop/Start Transport Client is used to stop or start the eS-WiFi module's Transport Client mode. The AT Command 'P1' is used to select between TCP, UDP or UDP Lite server protocols. The Transport Client modes are listed in Table 4.8.

Transport Client	Transport Client Mode
Client Disable	0
Client Enable	1

Figure 4.8: Transport Client Mode

Usage: P6=<Transport Client Modes><CR>

Default Value: P5=0

4.11.8 'P7' Start/Stop Request TCP Loop

Controls the Request TCP Loop. Closing socket allows the next listen backlog to be handled.

Usage: P7=<Value><CR>

Value	Loop Function
0	Stop
1	Start
2	Close Socket

Default Value: P7=0

4.11.9 'P8' Set Listen Backlogs

Set the number of listen backlogs (TCP connection requests) that can be queued.

Usage: P8=<value><CR>

Range: 1 to 30 backlogs

Default Value: P8=1

4.11.10 'PR' Packet Bypass Mode (PBM) Read Mode

Set the Packet Bypass Mode (PBM). In this mode Ethernet packets are forwarded from the WiFi interface, bypass the internal TCI/IP stack and are presented to the host interface.

Usage: PR=<Value><CR>

Value	Bypass Mode
0	Normal (No Bypass)
1	Forward All
2	Forward Non-ARP
3	Copy All
4	Copy Non-ARP

Note: In all mode the packets forwarded or copied can be filtered with the PF command.

Default Value: PR=0

4.11.11 'PW' Packet Bypass Mode (PBM) Write Packet

This writes Ethernet packets directly to the WiFi interface bypassing the internal TCP/IP stack.

Usage: PW=<NOB>,<DATA><CR>

NOB = Number of Bytes to send.

Data = Ethernet Packet (1516 Bytes Max.)

Default Value: None

4.11.12 'P?' Show Transport Settings

Return current Transport Communication Settings.

Usage: P?<CR>

Field	1	2	3	4	5	6	7	
Function	Protocol	Client IP	Local Port	Host IP	Remote Port	TCP Server	UDP Server	
Field	8	9	10					
Function	TCP Backlogs	Accept Loop	Read Mode					

Default Value: None

4.12 Receive Transport Data

Once the Transport Protocol has been defined and either the server or client mode has been enabled, data can be received from a connected server or client using the AT Command 'R0' with AT Command 'R1' setting the size of data to read from the transport protocol stack. For TCP data, multiple reads may have been needed to return all of the available data; however, for UDP, data received greater than the number of bytes defined by the AT Command 'R1' will be lost.

4.12.1 'R0' Read Transport Data

Available receive data is read using the AT Command 'R0'. 'R0' reads the transport buffer for AT Command 'R1' size bytes. Multiple reads may be needed to read all of the available TCP data. UDP data received greater than the bytes size defined by R1 will be lost.

Usage: R0<CR>

Default Value: None

4.12.2 'R1' Set Read Transport Packet Size (bytes)

The AT Command 'R1' is a user defined value for the packet size of data to return a data read. The AT Command 'R1' should be set before performing AT Command 'R0'. The input range for AT Command 'R1' is 0 to 1200 bytes.

Usage: R1=<Data Packet Size><CR>

Default Value: R1=1200

4.12.3 'R2' Set Read Transport Timeout (ms)

The AT Command 'R2' is a user defined value for the amount of time in milliseconds to wait on the Read Transport Data AT Command 'R2' to finish. The input range for R2 is 0 to 30000 milliseconds.

Usage: R2=<Read Transport Timeout><CR>

Default Value: R1=5000

4.12.4 'R3' Set Receive Mode

The AT Command R3 sets the receive mode. In receive mode = 1 the CRLF(Carriage Return/ Line Feed) delineation are removed from the Read response.

Usage: R3=<Value><CR>

Value	Receive Mode
0	Normal
1	No Delineation

Default Value: None

4.12.5 'R?' Show Read Transport Settings

Return current Receive Transport Data Settings.

Usage: R?<CR>

Field	1	2	3
Function	Number of Bytes	Timeout	Receive Mode

Default Value: None

4.13 Write Transport Data

Once the Transport Protocol has been define and either the server or client mode has been enabled, data can be written to a connected Transport Server or Client using the AT Command 'S0' with AT Command 'S1' defining the size of data to write.

4.13.1 'S0' Write Transport Data

The AT Command 'S0' is used to write data to a Transport Server or Client. The size of the data to write is defined via the AT Command 'S1'. After the AT Command 'S0' is entered, any data writing to the eS-WiFi module's selected communicating interface will be sent to a connected Transport Server or Client. Once the number bytes defined by AT Command 'S1' have been sent, the eS-WiFi module will return back to the AT Command mode waiting for the next 'AT Command'. If more bytes are written to the eS-WiFi module than are defined by the AT Command 'S1', the data will be lost and error message will be returned on the excess data written to the eS-WiFi module selected communication interface.

Usage: S0<CR>

4.13.2 'S1' Set Write Transport Packet Size (bytes)

AT Command 'S1' is used to define the packet size of data to write to a connected Transport Server or Client. The AT Command 'S1' should be set before a performing AT Command 'S0'.

Usage: S1=<Data Packet Size><CR>

Default Value: S1=1200

4.13.3 'S2' Set Write Transport Timeout (ms)

The AT Command 'S2' is a user defined value for the amount of time in milliseconds to wait on the Write Transport Data AT Command 'R2' to finish. The input range for S2 is 0 to 30000 milliseconds.

Usage: S2=<Write Transport Timeout><CR>

Default Value: S1=5000

4.13.4 'S?'" Show Write Transport Settings

Return current Write Transport Data Settings.

Usage: S?<CR>

Field	1	2
Function	Number of Bytes	Timeout

Default Value: None

4.14 Ping IP Target Address

Ping is a network utility for testing the reachability of hosts on a network. Ping will measure the round-trip time to a host or return a timeout if the host is not reachable.

4.14.1 'T0' Ping IP Target Address

The AT Command 'T0' will Ping a remote host returning the round-trip time or a timeout message. The host IP Address used by Ping must be set up by using the AT Command 'T1'.

Usage: T0<CR>

Default Value: None

4.14.2 'T1' Set Ping Target Address

The AT Command 'T1' is used to set the IP Address of the host to Ping.

Usage T1=<xxx.xxx.xxx.xxx><CR>

Default Value: 000.000.000.000

4.14.3 'T2' Set Ping Repeat Count

The AT Command 'T2' is used to define the number of times to repeat a Ping of a host on the network.

Usage T2=<Repeats><CR>

Default Value: T2=0

4.14.4 'T3' Set Ping Delay (ms)

The AT Command 'T3' is used to define the amount of time to wait between Pinging a host on the network. The amount of time to wait is defined in milliseconds and is limited to the range of 0 to 5000.

Usage T3=<delay in ms><CR>

Default Value: T3=0

4.14.5 'T?' Show Ping Settings

Return current Ping Settings.

Usage: T?<CR>

Field	1	2	3
Function	Target IP Address	Repeats (1+Repeats)	Delay

Default Value: None

4.15 Configure UART

The eS-WiFi module can be configured to use its serial interface for communications with a host computer or terminal console programs. Currently, the only UART Configuration mode for the eS-WiFi module is the serial interface, which is set to 8 data bits, no parity, one stop bits. The eS-WiFi modules can support baud rates from 1200 to 2073600 baud. The AT Command 'U2' is used to set the baud rate. The eS-WiFi module interface can also be set up in ASCII or Binary mode for data. In addition, the eS-WiFi module can be configured to generate timeout messages on the serial communications.

4.15.1 'U0' Activate UART Settings

The AT Command 'U0' is used to store the current eS-WiFi module UART settings in non-volatile memory for power on or after a reset for automatic configuration of the UART.

Usage: U0<CR>

Default Value: None

4.15.2 'U2' Set UART Baud Rate

The AT Command 'U2' is used to set the baud rate for the Comm Port selected using the AT Command 'U1'. Table 4.10 list the available eS-WiFi module baud rates.

Basic Baud Rates
1200
2400
4800
9600
19200
38400
57600
115200
230400
460800
921600

Table 4.10: Basic Baud Rates

Extended Baud Rates (M3G Version Only)
115200
1382400
1612800
1843200
2073600

Table 4.11: Extended Baud Rates

Usage: U2=<Baud Rate><CR>

Default Value: U2=115200

4.15.3 'U?' Show UART Setting

Return current UART Configuration.

Usage: U?<CR>

Field	1	2	3	4	5	6
Function	Port	Baud Rate	Data Width	Parity	Stop Bit(s)	Mode

Default Value: None

4.16 System Information

4.16.1 'Z0' Reset To Factory Defaults

Reset the current user space settings to factory default. The setting are not saved until a 'Z1' command is issued.

Usage: Z0<CR>

Default Value: None

4.16.2 'Z1' Save Current Settings

Saves the current user setting to the space selected with the 'Z3' command.

Usage: Z1<CR>

Default Value: None

4.16.3 'Z2' Clear Saved Settings

Clears the save settings space based upon the space selected with the 'Z3' command.

Usage: Z2<CR>

Default Value: None

4.16.4 'Z3' Set Factory/User Space

Selects the space that will be used by the 'Z1' and 'Z2' commands.

Usage: Z3=<Value><CR>

Value	Space
0	Factory
1	User

Default Value: None

4.16.5 'Z4' Set MAC Address

Sets the MAC address.

Usage: Z4=<XX:XX:XX:XX:XX:XX><CR>

Default Value: None

4.16.6 'Z5' Get MAC Address

Gets the MAC address.

Usage: Z5<CR>

Default Value: None

4.16.7 'Z6' Set Access Point IP Address

Sets the Access Point IP address.

Usage: Z6=<XXX.XXX.XXX.XXX><CR>

Default value: 192.168.10.1

4.16.8 'Z7' Set WPS Pin

Sets the 8 digit numeric WPS (WiFi Protected Setup) pin number.

Usage: Z7=<XXXXXXXX><CR>

Default Value: None

4.16.9 'Z8' Get WPS Pin

Gets the WPS (WiFi Protected Setup) pin number.

Usage: Z8<CR>

Default Value: 12345678

4.16.10 'Z9' Set USB VID/PID

Sets the USB VID (Vendor ID) and the PID (Product ID) (Valid only when firmware supports USB).

Usage: Z9=<XXXX,XXXX><CR>

Default Value: None

4.16.11 'ZC' Clear Factory Lock Switch

Clears the Factory Lock switch, allowing the factory flash space to be changed.

Usage: ZC=0<CR>

Default Value: None

4.16.12 'ZD' Flash Dump

Dumps the selected space from the 'Z3' command to the host interface.

Usage: ZD<CR>

Default Value: None

4.16.13 'ZF' Set Factory Lock Switch

Sets the Factory Lock switch, making the Factory space not changable.

Usage: ZF=1<CR>

Default Value: 0 (Unlocked)

4.16.14 'ZN' Set Product Name

Sets the Product Name reported by the Access Point web pages, the 'I?' and 'Z?' commands. The name can be up to 32 alphanumeric characters long.

Usage: ZN=<Product Name><CR>

Default Value: Inventek Systems eS-WiFi

4.16.15 'ZP' Power Management

Enable/Disable Power Management features.

Usage: ZP=<Feature>, <Value><CR>

Feature	Value	Description
0	None	WiFi On, All Power Save Off
1	0	Power Save Off
	1	Power Save On
2	1-60	Beacon Interval (sec)
3	0	WiFi Radio Off
	1	WiFi Radio On
4	None	Reset WiFi Radio

Default Value: Feature 0 (WiFi On, All Power Save Off)

4.16.16 'ZR' Reset Module

Software reset of the module. The equivalent of using the RTSN pin.

Usage: ZR<CR>

Default Value: None

4.16.17 'ZU' Firmware Upgrade (M3G Only, uses STM32F205 boot loader)

Starts the STM32F205 built in boot loader to upgrade the firmware.

Usage: ZU<CR>

Default Value: None

4.16.18 'Z?' Show System Settings

Returns current system settings.

Usage: Z?<CR>

Field	1	2	3	4	5	6	7
Function	Config- ration	WPS Pin	VID/PID	MAC	AP IP Address	PS Mode	Radio Mode
Field	8	9	10				
Function	Current Beacon	Previous Beacon	Product Name				

Default Value: None

5 Example eS-WiFi Module AT Command Usage

This section of the eS_WiFi Module User Manual covers example usage of the AT Command Set. Areas covered include Changing the Baud Rate, Scanning for Access Points, Joining Networks and transferring data via Transmission Control Protocol using TCP and UDP.

5.1 Entering Human Readable Command Mode

The eS-WiFi Module supports a Human Readable Command Mode for console interaction with the AT-Command set. For the AT Command usage examples that follow, the Human Readable Command Mode will be used. Sending the AT Command '\$\$\$' at the console prompt will put the eS-WiFi Module into human readable mode. Sending the AT Command '---' will take the eS-WiFi Module out of Human Readable mode and back into Machine Readable Mode, which is the default console mode for the eS-WiFi Module.

Entering Human Readable Mode example:

```
>$$$  
Entering CMD mode ---  
OK  
>
```

5.2 Changing the Baud Rate

One of the first things that may be useful when using the eS-WiFi Module is to up the data rate of the eS-WiFi Module serial interface for faster interaction with the console and data transfer.

Check Current Baud Rate:

```
>U?  
Communication Port:      UART  
      Baud Rate:        115200  
      Data Width:       8 bit  
      Parity:           NONE  
      Stop Bits:        1  
      Mode:             ASCII  
      RX Timeout:      0 ms  
      TX Timeout:      0 ms  
OK  
>
```

Set New Baud:

```
>U2=921600  
OK  
>
```

Activate Baud Change:

```
>U0
```

At this point the eS-WiFi Module will expect a faster or slower baud rate depending on the baud rate used for U2. The next step is to change the baud rate of the system to continue communicating with the eS-WiFi Module. After changing the System baud, sending a <CR> should return the console prompt '>', If not reset the eS-WiFi Module and retry changing the baud.

Check Baud Rate After Change:

```
>U?
Communication Port:      UART
  Baud Rate:        921600
  Data Width:       8 bit
  Parity:          NONE
  Stop Bits:        1
  Mode:            ASCII
  RX Timeout:      0 ms
  TX Timeout:      0 ms
```

OK

>

Finding Access Points

The first steps in joining a network is to determine available Access Points in the listening range of the eS-WiFi Module. The eS-WiFi Module AT Command Set supports functions for finding Access Points. The AT Command for finding Access Points can be used without joining a network.

5.3 Find Access Points:

```
> F0
waiting for scan results...
#001 SSID      : mars
  BSSID      : CC:33:CC:99:39:00
  RSSI       : -39dBm
  Max Data Rate : 54.0 Mbits/s
  Network Type : Infrastructure
  Security    : WPA2 AES
  Radio Band  : 2.4GHz
  Channel     : 2
#002 SSID      : jupiter
  BSSID      : EE:99:FF:AA:DD:00
  RSSI       : -90dBm
  Max Data Rate : 54.0 Mbits/s
  Network Type : Infrastructure
  Security    : WPA2 AES
  Radio Band  : 2.4GHz
  Channel     : 1
#003 SSID      : saturn
  BSSID      : FF:11:00:55:CC:EE
  RSSI       : -90dBm
  Max Data Rate : 54.0 Mbits/s
  Network Type : Infrastructure
  Security    : WEP
  Radio Band  : 2.4GHz
  Channel     : 6
#004 SSID      : uranus
  BSSID      : 33:44:99:44:11:CC
  RSSI       : -94dBm
  Max Data Rate : 54.0 Mbits/s
  Network Type : Infrastructure
  Security    : WPA2 AES
  Radio Band  : 2.4GHz
  Channel     : 11
End of scan results
OK
>
```

If needed, the eS-WiFi Module can be set up to scan a number of times for Access Points. This mode can be helpful during set up or debug on a network. The example below sets up the eS-WiFi Module to run 5 Access Point scans.

```
> F1=5
OK
>

> F0
Waiting for scan results...
... (returned data)
End of scan results
Waiting for scan results...
... (returned data)
End of scan results
Waiting for scan results...
... (returned data)
End of scan results
Waiting for scan results...
... (returned data)
End of scan results
Waiting for scan results...
... (returned data)
End of scan results
OK
>
```

The eS-WiFi Module can also be set up using an AT Command to delay between scans. The delay is set in milliseconds. The time range for delay is 0 to 5000 milliseconds.

Delay one second between scans:

```
> F2=1000
OK
>
```

Check current Find settings:

```
> F?
  Scan Repeats:      10
  Scan Delay in ms: 1000
OK
>
```

5.4 Join Network Access Point

To join a Network Access Point, the SSID, the PASSWORD, the Security Mode, and the IP Address mode (DHCP or locally assigned IP Address) must be set. See your network administrator for information needed to accessing Access Points on your network.

Using the information returned from previous network scan (F0) and network information supplied by the Network Administrator, the eS-WiFi module can be configured to join an Access Point on the Network.

The following example shows how to join an Access Point using DHCP; however, a locally defined IP Address can also be used. Refer to the sections 4.6.4, 4.6.6, and 4.6.7 on setting a local IP Address for the eS-WiFi module.

Set SSID for Access Point:

```
> C1=mars
Ok
>
```

Set Password for Access Point:

```
> C2=PASSWORD
OK
>
```

Set Security Mode (WPA2 AES) for Access Point:

```
> C3=3
OK
>
```

Set eS-WiFi Module IP Address via DHCP:

```
> C4=1
OK
>
```

Check Network Join settings before joining Access Point:

```
> C?
SSID:      mars
PSWD:      PASSWORD
SECURITY:  WPA2 AES
DHCP:      Enabled
IP:        IPV4
IP ADDR:   0.0.0.0
MASK:      0.0.0.0
GW ADDR:   0.0.0.0
DNS1:      0.0.0.0
DNS2:      0.0.0.0
Join Retries: 5
Auto Connect: 0
Status:     Not Connected
OK
>
```

Join Network Access Point mars, using PASSWORD, WPA2 AES, and DHCP:

```
> C0
Joining : mars
Successfully joined : mars
Obtaining IP address via DHCP
Network ready IP: 192.168.1.117
OK
>
```

Check Network Join Settings after joining Access Point:

```
> C?
SSID:      mars
PSWD:      PASSWORD
SECURITY:  WPA2 AES
DHCP:      Enabled
IP:        IPV4
IP ADDR:   192.168.1.117
```

```

  MASK: 255.255.255.0
  GW ADDR: 192.168.1.1
  DNS1: 0.0.0.0
  DNS2: 0.0.0.0
Join Retries: 5
Auto Connect: 0
  Status: Connected
OK
>
  
```

5.5 Ping a System on a Network

From time to time there is a need to Ping a system on a network or Ping a system while debugging a connection on the network. The eS-WiFi module can be configured to Ping systems on a network. To Ping a system on a network from the eS-WiFi Module, the IP Address of the system must be set up. In addition to setting up IP Address for the system to ping, the number of times to perform the Ping and the delay between Pings can be set. Assuming that eS-WiFi Module has already joined to a network, the following steps will ping a system on the network.

Set Ping IP Address to 192.168.1.90 for a system on the Network:

```

> T1=192.168.1.90
OK
>
  
```

Set Ping Repeats to 5:

```

> T2=5
OK
>
  
```

Set Ping Delay to 500 milliseconds:

```

> T3=500
OK
>
  
```

Check Ping Settings:

```

> T?
Ping Target Address: 192.168.1.90
  Ping Repeats: 5
  Ping Delay: 500 ms
OK
>
  
```

Ping 192.168.1.90 on the network for five times with a 500 millisecond delay between pings:

```

> T0
Pinging: 192.168.1.90
Ping Reply 32ms
Pinging: 192.168.1.90
Ping Reply 5ms
Pinging: 192.168.1.90
Ping Reply 3ms
Pinging: 192.168.1.90
Ping Reply 4ms
Pinging: 192.168.1.90
Ping Reply 6ms
OK
  
```

>

5.6 Transmission Control Protocol

To move data across a network, Transmission Control Protocol is often used. The eS-WiFi Module can be configured to be a Server or Client on a network for Transmission Control Protocol communications. Also, the eS-WiFi Module supports TCP and UDP protocols for data transfer. The examples that follow show TCP and UDP Server, and TCP and UDP Client operational modes of the eS-WiFi module. The following examples also assume that Transmission Control Protocol software is used on the remote Server or remote Client system and that a port number has been set up for use.

5.6.1 TCP Server Set up and Data Transport

The first step in setting up the eS-WiFi Module to be a TCP server on the Network, assuming the eS-WiFi has been joined to a Network, is to set the protocol mode, followed by enabling the TCP server mode. Once the eS-WiFi Module is in TCP server mode, data can then be written to and read from a remote client on the network.

5.6.1.1 TCP Server Set Up

Set protocol to TCP:

```
> P1=0  
OK
```

Set local TCP Port Number to 5024:

```
> P2=5024  
OK  
>
```

Enable TCP Server mode (the eS-WiFi Module will wait for a connection from a remote Client):

```
> P5=1  
TCP Task set up  
OK  
> Waiting on TCP connection ...  
> Accepted TCP connection from 192.168.1.107 on port 5024  
>
```

Check TCP Server Mode Configuration:

```
> P?  
  Transport Protocol: TCP  
  Client IP ADDR: 192.168.1.107  
  Local Port: 5024  
  Remote Host IP ADDR: 0.0.0.0  
  Remote Host Port: 5025  
  TCP Server Enabled: Yes  
  UDP Server Enabled: No  
OK  
>
```

5.6.1.2 Read and Write TCP Data in Server Mode

The eS-WiFi Module can read and write data over the network using Transmission Control Protocol. To aid in moving data over the network, the eS-WiFi Module's AT Command Set has commands for setting the Packet Size and for setting the Timeouts for data movement. For TCP communications, multiple reads may be needed to read all available data received. If no data is available, the read will timeout.

Set 1200 byte packet size for Read (range 1 to 1200):

```
> R1=1200
OK
>
```

Set five second timeout for Read in milliseconds (range 0 to 5000):

```
> R2=5000
```

Check Read Configuration:

```
> R?
Number of TCP/UDP bytes to receive per read: 1200
TCP/UDP receive timeout: 5000 ms
OK
>
```

Perform Read of Remote Client:

```
> R0
testing... 1234567890
OK
>
```

Write data to Remote Client:

```
> S0
0123456789
timeout detected... bytes sent 10
OK
>
```

The timeout was detected because the packet size was set to 1200 bytes, but only 10 bytes were written to the remote client. After a 5000 millisecond delay and no further data, the 10 bytes were sent.

5.6.2 TCP Client Setup and Data Transport

The first step in setting up the eS-WiFi Module to be a client on a Network, assuming the eS-WiFi has been joined to a Network, is to set the protocol mode, the remote port number, and remote server IP Address. Once the eS-WiFi Module has been set up as a client for TCP data transfer, data can then be written and read from a remote server on the network.

5.6.2.1 TCP Client Set Up

Set protocol to TCP:

```
> P1=0  
OK
```

Set remote Server IP Address:

```
> P3=192.168.1.110  
OK
```

Set remote TCP Port Number to 5025:

```
> P4=5025  
OK  
>
```

Enable TCP Client mode:

```
> P6=1  
Connecting to 192.168.1.110  
OK  
>
```

Once the TCP Client mode AT Command returns to the console, a connection has been established with a remote server or an error message will be generated on a connection failure.

Check TCP Client Mode Configuration:

```
> P?  
Transport Protocol: UDP  
Client IP ADDR: 0.0.0.0  
Local Port: 5024  
Remote Host IP ADDR: 192.168.1.110  
Remote Host Port: 5025  
TCP Server Enabled: NO  
UDP Server Enabled: NO  
OK  
>
```

5.6.2.2 Read and Write TCP Data in Client Mode

The eS-WiFi Module can read and write data over the network using Transmission Control Protocol. To aid in moving data over the network, the eS-WiFi Module's AT Command Set has commands for setting the Packet Size and for setting the Timeouts for data movement. For TCP communications, multiple reads may be needed to read all available data received. If no data is available, the read will timeout.

Set 1200 byte packet size for Read:

```
> R1=1200  
OK  
>
```

Set five second timeout for Read in milliseconds:

```
> R2=5000
```

Check Read Configuration:

```
> R?  
Number of TCP/UPD bytes to receive per read: 1200  
TCP/UPD receive timeout: 5000 ms  
OK  
>
```

Perform Read of Remote Client:

```
> R0  
testing... 1234567890  
OK  
>
```

Write data to Remote Client:

```
> S0  
0123456789  
timeout detected... bytes sent 10  
OK  
>
```

The timeout was detected because the packet size was set to 1200 bytes, but only 10 bytes were written to the remote client. After a 5000 millisecond delay and no further data, the 10 bytes were sent.

5.6.3 UDP Server Set Up and Data Transport

The first step in setting up the eS-WiFi Module to be a UDP server on the Network, assuming the eS-WiFi has been joined to a Network, is to set the protocol mode, followed by enabling the UDP server mode. Once the eS-WiFi Module is in UDP server mode, data can then be written to and read from a remote client on the network.

5.6.3.1 UDP Server Set Up

Set protocol to UDP:

```
> P1=1  
OK
```

Set local UDP Port Number to 5024:

```
> P2=5024  
OK  
>
```

Enable UDP Server mode (the eS-WiFi Module will wait for a connection from a remote Client):

```
> P5=1  
UDP Task set up  
OK  
> Waiting on UDP connection ...  
> Accepted UDP connection from 192.168.1.110 on port 5024  
>
```

Check UDP Server Mode Configuration:

```
> P?  
Transport Protocol: UDP
```

Client IP ADDR:	192.168.1.110
Local Port:	5024
Remote Host IP ADDR:	0.0.0.0
Remote Host Port:	5025
TCP Server Enabled:	No
UDP Server Enabled:	Yes

OK
>

5.6.3.2 Read and Write UDP Data in Server Mode

The eS-WiFi Module can read and write data over the network using Transmission Control Protocol. To aid in moving data over the network, the eS-WiFi Module's AT Command Set has commands for setting the Packet Size and for setting the Timeouts for data movement. For UDP communications, the number bytes sent to the server must match the number bytes to read -- any additional data sent to the server may be lost.

Set 1200 byte packet size for Read (range 1 to 1200):

```
> R1=1200
OK
>
```

Set five second timeout for Read in milliseconds (range 0 to 5000):

```
> R2=5000
```

Check Read Configuration:

```
> R?
Number of TCP/UDP bytes to receive per read: 1200
      TCP/UDP receive timeout: 5000 ms
OK
>
```

Perform Read of Remote Client:

```
> R0
testing... 1234567890
OK
>
```

Write data to Remote Client:

```
> S0
0123456789
timeout detected... bytes sent 10
OK
>
```

The timeout was detected because the packet size was set to 1200 bytes, but only 10 bytes were written to the remote client. After a 5000 millisecond delay and no further data, the 10 bytes were sent.

5.6.4 UDP Client Setup and Data Transport

The first step in setting up the eS-WiFi Module to be a client on a Network, assuming the eS-WiFi has been joined to a Network, is to set the protocol mode, the remote port number, and remote server IP Address. Once the eS-WiFi Module has been set up as a client for UDP data transfer, data can then be written and read from a remote server on the network.

5.6.4.1 UDP Client Set Up

Set protocol to UDP:

```
> P1=0  
OK
```

Set remote Server IP Address:

```
> P3=192.168.1.110  
OK
```

Set remote UDP Port Number to 5025:

```
> P4=5025  
OK  
>
```

Enable UDP Client mode:

```
> P6=1  
Connecting to 192.168.1.110  
OK  
>
```

Once the UDP Client mode AT Command returns to the console, a connection has been established with a remote server or an error message will be generated on a connection failure.

Check UDP Client Mode Configuration:

```
> P?  
    Transport Protocol: UDP  
    Client IP ADDR: 0.0.0.0  
    Local Port: 5024  
    Remote Host IP ADDR: 192.168.1.110  
    Remote Host Port: 5025  
    TCP Server Enabled: NO  
    UDP Server Enabled: NO  
OK  
>
```

5.6.4.2 Read and Write UDP Data in Client Mode

The eS-WiFi Module can read and write data over the network using Transmission Control Protocol. To aid in moving data over the network, the eS-WiFi Module's AT Command Set has commands for setting the Packet Size and for setting the Timeouts for data movement. For UDP communications, the number bytes sent to the server must match the number bytes to read -- any additional data sent to the server may be lost.

Set 1200 byte packet size for Read:

```
> R1=1200
OK
>
```

Set five second timeout for Read in milliseconds:

```
> R2=5000
```

Check Read Configuration:

```
> R?
Number of TCP/UDP bytes to receive per read: 1200
TCP/UDP receive timeout: 5000 ms
OK
>
```

Perform Read of Remote Client:

```
> R0
testing... 1234567890
OK
>
```

Write data to Remote Client:

```
> S0
0123456789
timeout detected... bytes sent 10
OK
>
```

The timeout was detected because the packet size was set to 1200 bytes, but only 10 bytes were written to the remote client. After a 5000 millisecond delay and no further data, the 10 bytes were sent.

6. Appendix A

Country	Code	Country	Code	Country	Code
AFGHANISTAN	AF	GREECE	GR	OMAN	OM
ALBANIA	AL	GRENADA	GD	PAKISTAN	PK
ALGERIA	DZ	GAUDELOUPE	GP	PALAU	PW
AMERICAN_SAMOA	AS	GUAM	GU	PANAMA	PA
ANGOLA	AO	GUATEMALA	GT	PAPUA_NEW_GUINEA	PG
ANGUILLA	AI	GUERNSEY	GG	PARAGUAY	PY
ANTIGUA_AND_BARBUDA	AG	GUINEA	GN	PERU	PE
ARGENTINA	AR	GUINEA_BISSAU	GW	PHILIPPINES	PH
ARMENIA	AM	GUYANA	GY	POLAND	PL
ARUBA	AW	HAITI	HT	PORTUGAL	PT
AUSTRALIA	AU	HOLY_SEE_VATICAN_CITY_STATE	VA	PUERTO_RICO	PR
AUSTRIA	AT	HONDURAS	HN	QATAR	QA
AZERBAIJAN	AZ	HONG_KONG	HK	REUNION	RE
BAHAMAS	BS	HUNGARY	HU	ROMANIA	RO
BAHRAIN	BH	ICELAND	IS	RUSSIAN_FEDERATION	RU
BAKER_ISLAND	OB	INDIA	IN	RWANDA	RW
BANGLADESH	BD	INDONESIA	ID	SAINT_KITTS_AND_NEVIS	KN
BARBADOS	BB	IRAN_ISLAMIC REPUBLIC_OF	IR	SAINT_LUCIA	LC
BELARUS	BY	IRAQ	IQ	SAINT_PIERRE_AND_MIQUELON	PM
BELGIUM	BE	IRELAND	IE	SAINT_VINCENT_AND_THE_GRENADINES	VC
BELIZE	BZ	ISRAEL	IL	SAMOA	WS
BENIN	BJ	ITALY	IT	SANIT_MARTIN_SINT_MARTEEN	MF
BERMUDA	BM	JAMAICA	JM	SAO_TOME_AND_PRINCIPE	ST
BHUTAN	BT	JAPAN	JP	SAUDI_ARABIA	SA
BOLIVIA	BO	JERSEY	JE	SENEGAL	SN
BOSNIA_AND_HERZEGOVINA	BA	JORDAN	JO	SERBIA	RS
BOTSWANA	BW	KAZAKHSTAN	KZ	SEYCHELLES	SC
BRAZIL	BR	KENYA	KE	SIERRA_LEONE	SL
BRITISH_INDIAN_OCEAN_TERRITORY	IO	KIRIBATI	KI	SINGAPORE	SG
BRUNEI_DARUSSALAM	BN	KOREA REPUBLIC_OF	KR	SLOVAKIA	SK
BULGARIA	BG	KOSOVO	OA	SLOVENIA	SI
BURKINA_FASO	BF	KUWAIT	KW	SOLOMON_ISLANDS	SB
BURUNDI	BI	KYRGYZSTAN	KG	SOMALIA	SO
CAMBODIA	KH	LAO_PEOPLES DEMOCRATIC REPUBLIC	LA	SOUTH_AFRICA	ZA
CAMEROON	CM	LATVIA	LV	SPAIN	ES
CANADA	CA	LEBANON	LB	SRI_LANKA	LK
CAPE_VERDE	CV	LESOTHO	LS	SURINAME	SR
CAYMAN_ISLANDS	KY	LIBERIA	LR	SWAZILAND	SZ
CENTRAL_AFRICAN REPUBLIC	CF	LIBYAN_ARAB_JAMAHIRIYA	LY	SWEDEN	SE
CHAD	TD	LIECHTENSTEIN	LI	SWITZERLAND	CH
CHILE	CL	LITHUANIA	LT	SYRIAN_ARAB REPUBLIC	SY
CHINA	CN	LUXEMBOURG	LU	TAIWAN_PROVINCE_OF_CHINA	TW
CHRISTMAS_ISLAND	CX	MACAO	MO	TAJIKISTAN	TJ
COLOMBIA	CO	MACEDONIA FORMER YUGOSLAV REPUBLIC_OF	MK	TANZANIA UNITED REPUBLIC_OF	TZ
COMOROS	KM	MADAGASCAR	MG	THAILAND	TH
CONGO	CG	MALAWI	MW	TOGO	TG
CONGO_THE DEMOCRATIC REPUBLIC_OF_THE	CD	MALAYSIA	MY	TONGA	TO
COSTA_RICA	CR	MALDIVES	MV	TRINIDAD_AND_TOBAGO	TT
COTE_DIVOIRE	CI	MALI	ML	TUNISIA	TN
CROATIA	HR	MALTA	MT	TURKEY	TR
CUBA	CU	MAN_ISLE_OF	IM	TURKMENISTAN	TM
CYPRUS	CY	MARTINIQUE	MQ	TURKS_AND_CAIOS_ISLANDS	TC
CZECH REPUBLIC	CZ	MAURITANIA	MR	TUVALU	TV

Country	Code	Country	Code	Country	Code
DENMARK	DK	MAURITIUS	MU	UGANDA	UG
DJIBOUTI	DJ	MAYOTTE	YT	UKRAINE	UA
DOMINICA	DM	MEXICO	MX	UNITED_ARAB_EMIRATES	AE
DOMINICAN_REPUBLIC	DO	MICRONESIA_FEDERATED_STATES_OF	FM	UNITED_KINGDOM	GB
ECUADOR	EC	MOLDOVA_PUBLIC_OF	MD	UNITED_STATES	US
EGYPT	EG	MONACO	MC	UNITED_STATES_REV4	US
EL_SALVADOR	SV	MONGOLIA	MN	UNITED_STATES_NO_DFS	Q2
EQUATORIAL_GUINEA	GQ	MONTENEGRO	ME	UNITED_STATES_MINOR_OUTLYING_ISLANDS	UM
ERITREA	ER	MONTSERRAT	MS	URUGUAY	UY
ESTONIA	EE	MOROCCO	MA	UZBEKISTAN	UZ
ETHIOPIA	ET	MOZAMBIQUE	MZ	VANUATU	VU
FALKLAND_ISLANDS_MALVINAS	FK	MYANMAR	MM	VENEZUELA	VE
FAROE_ISLANDS	FO	NAMIBIA	NA	VIET_NAM	VN
FIJI	FJ	NAURU	NR	VIRGIN_ISLANDS_BRITISH	VG
FINLAND	FI	NEPAL	NP	VIRGIN_ISLANDS_US	VI
FRANCE	FR	NETHERLANDS	NL	WALLIS_AND_FUTUNA	WF
FRENCH_GUINA	GF	NETHERLANDS_ANTILLES	AN	WEST_BANK	OC
FRENCH_POLYNESIA	PF	NEW_CALEDONIA	NC	WESTERN_SAHARA	EH
FRENCH_SOUTHERN_TERRITORIES	TF	NEW_ZEALAND	NZ	YEMEN	YE
GABON	GA	NICARAGUA	NI	ZAMBIA	ZM
GAMBIA	GM	NIGER	NE	ZIMBABWE	ZW
GEORGIA	GE	NIGERIA	NG		
GERMANY	DE	NORFOLK_ISLAND	NF		
GHANA	GH	NORTHERN_MARIANA_ISLANDS	MP		
GIBRALTAR	GI	NORWAY	NO		

7. Document Revision History

Date	Name	Description	Revision	File Name
12/08/11	RES	Initial Creation	0.1	AT Command Set.docx
12/15/11	RES	Initial Release	1.0	AT Command Set r1.0.docx
12/15/11	SEP	Minor corrections/formatting	1.1	AT Command Set r1.1.docx
1/2/2012	RES	Added Usage Examples	1.2	AT Command Set r1.2.docx
3/12/2012	MFT	Changed Logo	1.3	AT Command Set r1.3.docx
11/21/12	SEP	Update with new commands	1.4	AT Command Set r1.4.docx

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